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AUTHOR Senese, Donald J.
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ABSTRACT

Within the present "Information Age" there is a grassroots movement calling for reform and improvement of our educational system. With the advent of the computer, this movement will stimulate profound changes over coming decades that will affect the number of off-campus students and adult education programs. Just as previous technologies brought significant opportunities for education, the computer will provide new opportunities by enhancing individualized interactive instruction in every kind of setting, from the school to the home, to the library, and to the community. It will allow for distance education courses, home study courses for individuals interested in self-growth, and a greater opportunity for corporations to train their workforces. Electronic learning offers low cost, quality individualized instruction as the computer adopts the best method of learning for individual students. Students can work at their own speed, drill themselves as needed, receive oral instructions if they learn better through hearing, or spend time reading and writing on screens if they learn better through visual information. Essentially, the computer will assist in both equity and excellence of education by providing accessible education to more people, while providing greater diversity of courses covering a wider range of knowledge. This expansion of education can develop a more knowledgeable population and informed worker and consumer, which in turn will aid American productivity at home and leadership in the world. (DJR)

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"The Impact of College Through Computers on the
Future of American Education"

by
Dr. Donald J. Senese
Assistant Secretary for
Educational Research and Improvement
U.S. Education Department

Dinner for Educators and Education Writers
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Donald J. Senese

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Good evening.

It is a great pleasure to be in New York City at such a gathering of distinguished educators and outstanding writers on education issues.

All of us realize the great importance of education as an issue in our national life. It is especially encouraging to see people throughout the United States arrive at the same conclusion especially with the release of the report of the National Commission on Excellence in Education last April and the many subsequent reports released since that time. The National Forum on Excellence in Education, sponsored by the U.S. Education Department last December in Indianapolis, brought together over 2300 educators, state legislators, school board members, and association officials among others focusing on the road to improvement. The demand for educational improvement is a grassroots movement and a tide of educational reform is sweeping through our fifty states. It has been encouraging such momentum as continued through this vital election year becoming a part of our national debate on issues. It is particularly appropriate that we gather tonight and tomorrow to consider a new step which offers great promise for the improvement of our educational system--the harnessing of technology aimed toward the electronic university.

My topic this evening is "The Impact of College Through Computers on the Future of American Education."

Allow me to begin with a summary commentary linking the computer and education--a summary commentary which represents a consensus on what individuals who have looked at this relationship and have related it to our present "Information Age" believe.

The computer will stimulate profound changes in education over at least the next two decades. It has already profoundly affected the acquisition of knowledge and the conduct of research in higher education. Its effects on the organization and retrieval of information, specifically library functions, are becoming increasingly evident. It will soon affect changes in the number of off campus students and on education-out-of-school (or so-called adult education). And together with new knowledge from research in cognitive science, it must ultimately affect teaching and learning in the classroom.

A discussion of any innovation requires the dispelling of certain myths or views which gain a currency not because of fact but because of repetition by the unknowing and the uncaring. These myths include the following: the computer is a fad and like other fads, will be replaced by another fad in a few years; computers are not effective tools for learning; computers will be used to replace teachers and thus will render our educational system impersonal or even impotent; and finally, computers will take over our classrooms and lead to rote and non-creative learning. Although without careful planning and foresight some of these generalizations could conceivably occur, I think we can realistically dismiss these statements as unfounded fears.

In the computer field we need to be more optimistic than pessimistic, more realistic than idealistic. In other words, we need to focus our attention on being opportunity-oriented rather than problem-proned.

Dr. Herbert A. Simon, Professor of Psychology at Carnegie-Mellon University, has placed the development of the computer in proper perspective, especially as we relate its use in the field of education:

Nobody really needs convincing these days that the computer is an innovation of more than ordinary magnitude, a one-in-several-centuries innovation and not a one-in-a-century innovation or one of these instant revolutions that are announced every day in the papers or on television. It really is an event of major magnitude.

By careful observation and the use of imagination, it is not necessary to be either a seer or a sage to realize that the key to the expansion of education over the coming decades will be the computer which in every kind of setting from the school to the home to the library to the community will enhance individualized instruction. A Nation At Risk, the report of the National Commission on Excellence in Education, challenged our nation to set the goal of building a "Learning Society." Education has a better chance of becoming a lifelong pursuit from computer lessons in kindergarten to graduate degrees for senior citizens by use of the computer.

We should realize that we need to consider the computer in two aspects: the invention itself and the uses to which the creative genius of an individual person might discover.

We have seen great developments in the computer in just a relatively short time--a reduction in size, an increase in capacity, and a rapid decline in cost. The full size room computer has given way to the desk top model; the old vacuum tubes to the silicon chip; the price tag of tens of thousands of dollars have been replaced by costs of only

a few thousands or a few hundreds of dollars. As the outward physical and internal operating mechanism of the computer has changed so has the uses to which it can be utilized. Further and future uses of the computer may be so extensive that it reaches beyond the present capacity of the human mind to conceive. One observation has it that the present development of the computer could be as primitive in conception and use as the development of the automobile was in 1895.

History is full of developments which changed the human fate.

We once had a world of limited literacy and limited access to that literacy by most people. We had then the invention of printing which led to the mass production of books, newspapers, political pamphlets and subsequently encouraged widespread literacy and education.

Economists only a few centuries ago warned of the growing world population and a shortage of farm land and food which would lead to worldwide starvation. Then, we had the Industrial Revolution which led to new productive capacity on the farms, provided the means to mass produced goods under terms of declining prices, aided in the growth of non-agriculture employment, and brought improved living conditions to the people of the world.

The invention of the telephone led to widespread and rapid communication among people from city to city, across a country and throughout the world.

Yet, each and every one of these great developments were viewed with skepticism. The invention of printing was feared as a device which would educate too many people and expose them to revolutionary ideas; it would replace a whole class of individuals who spent their lives

hand-copying books. The Industrial Revolution was viewed as dehumanizing, as a threat to the values of an agrarian-based society, and as producing goods which most people could not use. Even at the time of the invention of the telephone by Alexander Graham Bell, many of the more intelligent people of the time viewed it with skepticism. A common reaction might have been: Why would anyone want to talk to another person over a wire?

Let us focus for a moment on the invention of the telephone. In less than a century since the invention of the telephone, the telephonic communication ranks as one of the all time critical change agents in the world.

This telephonic communication system made possible direct communication by one person with virtually any other person in the world and its impact has influenced the social, political and economic development of society. The creative genius of experts led to the expansion of telecommunications to include such developments as satellite communication, data transmission, video transmission and slow-scan and cable television.

All of these changes brought significant changes as well as enormous opportunities for education. It changed the old master-tutor relationship; it brought education beyond the four walls of the classroom; it expanded opportunities to tap knowledge throughout the world and to bring the wisdom of scholars from the far corners of the globe to the immediacy of one's own classroom and home. These changes helped to transform the home as well as the classroom into a learning environment.

Yet the computer offers to bring a new dimension to the focus of learning. Television offers a passive form of learning for the home and school, a one way reception by the student; the computer offers an interactive means of education in which the instructor and student can interact and exchange information hundreds or even thousands of miles away, eliminating time and geographic barriers.

Electronic learning has a great potential now just barely being realized for American education.

We can reach out to more and more people with a new system--computer to computer communication.

Education--particularly postsecondary--can go beyond barriers--people isolated in villages, prisons, nursing homes and confined for any reason at home or in an institution--can have access to a wide variety of learning.

Individuals can take courses or whole programs in their homes for training for the sake of learning new things or to prepare for new careers. We are living in a rapidly changing age when individuals can no longer be content with one career during a lifetime but may need to prepare for two or three or more career changes in a lifetime. Computers offer the individual a regular opportunity to upgrade skills or to acquire new skills. Knowledge can be more widely diffused in the career arena and great steps toward equity as under employment and underutilization of human resources can be eliminated, or certainly minimized. Corporations will have greater opportunity to train, retrain, and upgrade training of their workforce in a world growing more competitive for the United States.

Electronic learning via computers allows even more than other telecommunication developments the use of other than school rooms for education--libraries, museums, community centers, and one's own living room.

The interactive nature of communication plus pictures and graphics will allow students to get the benefit of outstanding teachers in specialized fields. Student contact with teachers will be enhanced--thousands of miles away yet still with direct contact.

Overall, this change can assist us in both equity and excellence. It can give access to education to more people with a greater diversity of courses with a wider range of knowledge. It can aid us as a national goal to more rapidly and effectively and efficiently educate more students at all levels. Two factors--one economic and one social--will assist in this development: (1) the personal computer very soon may be as cheap as a hand-held calculator and (2) personal computers will be almost as common as televisions in our country.

The interested student will be able to purchase a "knowledge package" which will allow the owner to sign up for a number of courses. The fee will include the "electronic lectures," telephone charges, and network transmission charges; students will receive from the teacher the text of lectures and graphics to accompany them as well as the opportunity to exchange messages (questions, test results, etc.) with the teacher through electronic mail. This academic innovation, linking students and teachers electronically, in college and university courses for credit offers a private sector opportunity to provide low cost and quality individualized instructions to everyone wishing to use their own abilities to expand their horizons of knowledge.

Allow me for just a moment to place this development of electronic learning in the context of certain changes all of us are witnessing about us. These are changes in three areas: changes in (1) society; (2) learning and (3) opportunity.

In society, John Naisbitt in Megatrends talks of a restructuring of American society now evolving with an economy based on the creation and distribution of information. This movement in the dual direction of high tech/high touch, he reminds us, matches each new technology with a compensatory human response. With the coming of that information society, we have an economy for the first time based on a key resource which is not only renewable but self-generating--an integrated information and communication system than transmits data and permits instantaneous interaction between persons and computers. "Information" is that key resource; self-generation is the issue. Naisbitt perceptively comments:

"Running out of it is not a problem,
but drowning in it is...We are
drowning in information but starved
for knowledge."

In learning, new research is telling us more and more about that unique human device--the brain. Recent research indicates that young brains develop in spurts rather than at a steady, continuous pace. For example, mathematical reasoning can be emphasized in certain age groups (e.g. 2-4, 6-8, 10-12, 14-16) when the brain is undergoing rapid expansion rather than at periods where the brain cannot handle these tasks as well.

Computer learning can be best adopted to the best method for the individual student. Students can work at their own speed on desk top computers on different subjects; a student can drill as much as he or she needs without taking up unnecessarily the time of the teacher and fellow classmates. Based on individual evaluation, students who learn better through hearing would receive much of their instruction orally while those who learn better through visual information would spend more time reading and writing on visual screens.

We as human beings have gone from hieroglyphic cave drawings to self-reflection to intuitive communication and computer-aided rational functions and may be ready for additional break-throughs in the use of the brain and the nature of intelligence. We must not limit our view of intelligence just to performance on S.A.T. (standardized achievement test) or I.Q. tests; we need to better understand the generation of new thoughts and ideas seeded by inner vision thus allowing a factor pointed out by the co-director of the California-based Center for Integrative Learning Beverly-Colleene Galyean: human history records the achievements of civilizations expanding and improving upon the creative genius of preceding civilizations.

There is a growing focus on research on artificial intelligence and specifically on what is termed the "fifth generation"—a new breed of supercomputers so fast that they can surpass today's machines a thousand times over and can outthink humans. This generation of computers would be able to reason, draw conclusions, make judgments and even understand the written and spoken word. The potential of these machines is so

great that the people who masters this development will find that it will not only change our lives and the way we think of ourselves as human beings but will profoundly affect the balance of power in the world.

It is important that we develop our human resources to the best extent possible for our survival as a nation. We have seen documented the decline of U.S. school standards since the early 1960s: class grades have remained up but real performance has gone down. Dr. Barbara Lerner has noted that this has occurred in a period where we have sent more of our young people to school for longer periods of time than any other nation in the world. American productivity has also declined during this period. Dr. Lerner warns that the U.S. might face the period where high level managerial, professional and scientific talent will be in short supply and consequently the U.S. may discover this situation bringing serious economic, political and social problems.

Perhaps the significance of the challenge we face in learning was best stated by Columbia University professor Diane Ravitch in her recent work The Troubled Crusade: American Education 1945-1980. Dr. Ravitch notes:

To believe in education is to believe in the future, to believe in what may be accomplished through the disciplined use of intelligence, allied with cooperation and good will. If it seems naively American to put so much stock in schools, colleges, universities, and the endless prospect of self-improvement and social improvement, it is an admirable, and perhaps even a noble flaw.

And finally, in opportunity, the U.S. must once again regain confidence in its ability to grow and expand and develop. During the 1960s and 1970s we experienced in our public life advocates of limited

growth and limited development, a philosophy leading to lack of confidence in ourselves and our society and a malaise prevalent in our institutions of higher education. The late Herman Kahn, in his last book, The Coming Boom, observed that one of the reasons he expected high and sustained growth rates through the 1980s and 1990s was because of a whole host of new technologies and technological improvements ripe for large-scale exploitation, notably computer networks.

The electronic learning culminating in the electronic university builds upon these amazing developments in society, in learning and in opportunity. The technology is here; the will to use it effectively must also be present.

I should mention that we need to be aware of the disadvantages or limits on this breakthrough—educators unwilling to change may resist; special interests may lobby vigorously against it fearing it will replace teachers; competitors may undermine it for their personal interest; an apathetic public may fail to respond; quality of courses may be compromised for a great quantity of students; equalitarians may be dissatisfied with opportunities for access.

However, we need to recognize the great advantages—electronic learning can give greater access, more extensive educational opportunities, and an enhanced relationship between teachers and students; this development requires no knowledge of technology except the ability to push buttons; expansion of education is related to the declining cost of technology; a great educational system can further expand developing a more knowledgeable population and informed worker

and consumer; an expanded and better educated population can assist American productivity at home, and American leadership in the world.

All of you gathered here--the innovators and inventors, the educators and education writers--all can play a vital role in this next stage of development for technology and education. As John Naisbitt writes in his final statement in Megatrends: "My God, what a fantastic time to be alive!"